CAM

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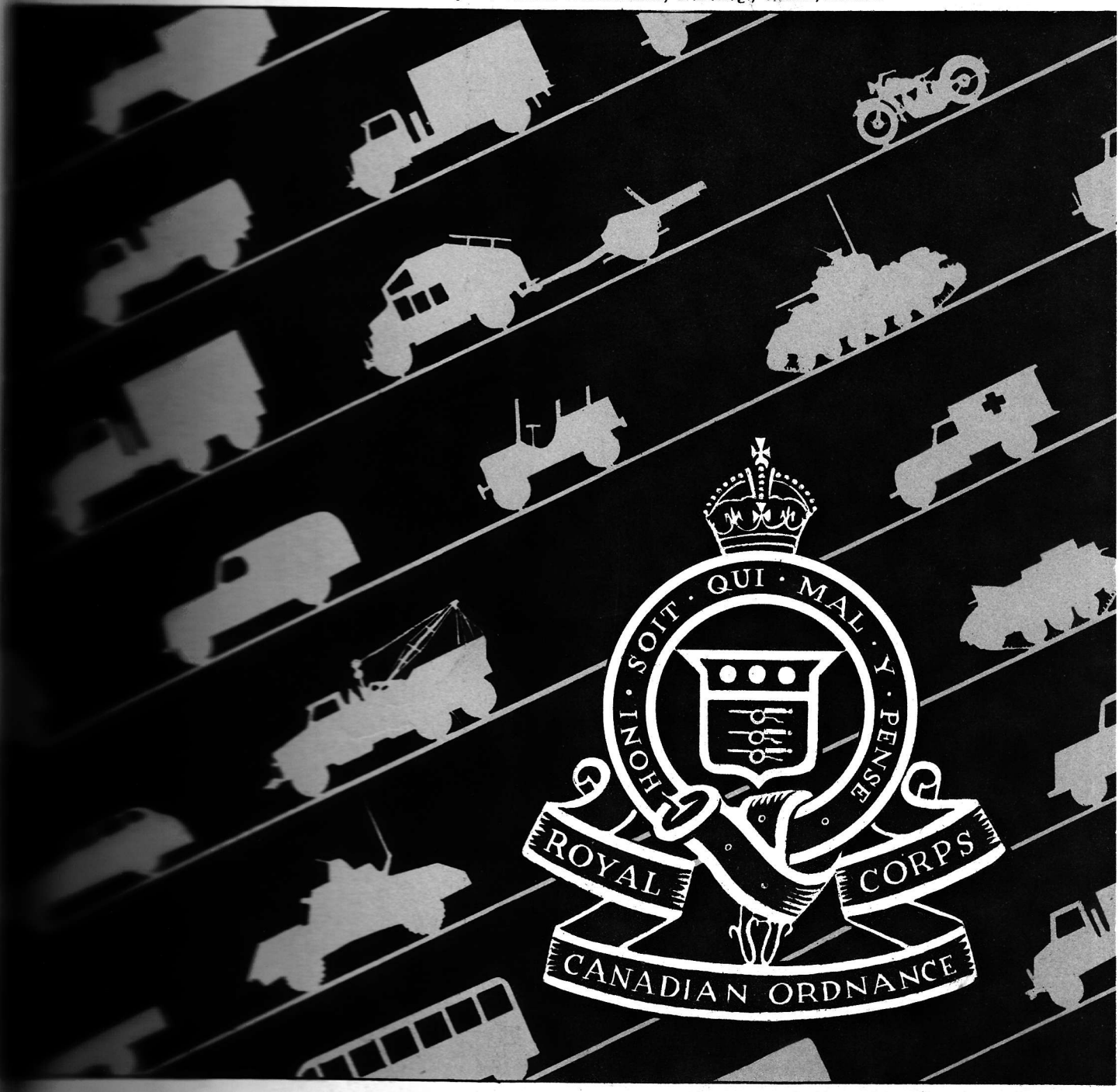

NUMBER 1

OCTOBER 1943

FROM THE OFFICE OF THE MASTER-GENERAL OF THE ORDNANCE

25th September, 1943.

MEN AND WOMEN OF THE CANADIAN ARMY:

I have followed with considerable interest he development of the Canadian Army Preventive Maintenance program. However, I feel, in the light of present day happenings, that we have reached a time when this program must no longer be regarded simply as a defence against deterioration, but rather as a means of preparing our vehicles for attack. We must bear in mind that it is the responsibility of the men and women of the Canadian Army, through the medium of Preventive Maintenance, to maintain them in their highest state of efficiency.

A clear and comprehensive system, covering Preventive Maintenance for the various types of our Military vehicles, has been standardized through the Canadian Army Manual of Maintenance and Lubrication, but let it be said that no system, however cleverly devised, will avail unless it is carefully and diligently applied.

I am hopeful that through the introduction of this publication, my organization at National Defence Headquarters may be able to render valuable service to you men in the field in getting directly to you items of technical interest and instruction in such a form that they may be easily read and digested.

The ultimate success of "CAM" will depend upon your reception of this material and its conscientious application in the interests of better maintenance.

Canada's problem is not more vehicles, but more from the vehicles that Canada has.

James S. Young.

Major-General,
Master-General of the Ordnance.

CAM

OCTOBER - 194
VOL. 1 No.

Contents

CAM is published mon
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to the non-commissioned
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Army.

Your contributions
articles and ideas
welcome. Address all co
pondence to the Editor, CA
Directorate of Mechan
Maintenance, Departme
National Defence, Ottawa.

What's this C.P.M.S. business all about?

It's a System of Preventive Maintenance that really works - - IF you give it half a chance

"I remember Preventive Maintenance away back in the old days", mused Sergeant O'Sweat over an [illegible] the canteen the other night—"Maintenance—Why, you monkeys don't know the meanin' of real Compulsory Preventive Maintenance!"

"Ever maintain a horse?", he [illegible] "that's maintenance that kept you steppin'. Up in the morning' fer feedin', groomin', cleanin', cleanin' harness, cleanin' stalls, haulin' feed, haulin' [illegible] and after you've put in your day of toil, and just when you're ready to eat a raw [illegible] first thing when you get back to quarters is to look after your horse. Not after supper, not after you've toddled over to fix up that leave pass— but **first** thing you water, feed and bed down your horse. Now don't talk to me about maintenance as tho' it were tough—'cos I know better, [illegible]"

"Pass the salt, Herkimer!"

"Now take these C.P.M.S. forms —Compulsory Preventive Maintenance Schedules One, Two and Three—sounds formidable but they ain't. I've overheard one or two of you wondering out loud what they're all about and why the . . . . they had to stick you in particular with the things, as if you didn't have enough to do to drive that truck all over the map without making a lot of ticks on a piece of paper before you start off and when you stop".

"The idea is that you've now got responsibilities—everytime you wheel one of those pieces of Ordnance off the park you're handling from two thousand to mebbe ten thousand dollars worth of equipment—which you have helped to purchase. Ever think of it that way? But what's more important still—it took a lot of valuable man hours to build that vehicle—and it would take more man hours to replace it, and man hours are more important than dollars even—they just can't be wasted, you can't buy back or replace time".

"O.K., Sarge, but how's our puttin' a bunch of ticks on a piece of paper going to make any difference to how a truck wears out—it's going to wear out anyway".

"You didn't get your wheaties this morning, Finnegan, or you would of woke up by now—sure your truck's going to wear—it's going to use up gas too, but that doesn't mean you're going to say—the gas tanks keep gettin' empty, so why keep fillin' 'em. No, the key to this here business is the Preventive part of P.M. You're going to prevent big troubles by nipping 'em off while they're little ones".

"Frinstance, supposing while you're doing your 'after operations' check and while you're in the cab with the engine turning over you notice the oil gauge is acting a bit queer—the needle is unsteady—or shows very little pressure even when you rev up the motor—item 3 on your C.P.M.S. No. 3 is the spot where you are now, so you put a 0 there instead of a ✓ and tip off your N.C.O. about the matter. Not much trouble is it? By the time you've completed the whole check you know whether there's sufficient oil in the crankcase and if there's any serious oil leaks kicking around and mebbe solved the problem right there. If you haven't accounted for the oil gauge's shenanigans the N.C.O's. got to get the unit mechanic after it pronto. But which ever way it is—the immediate reporting of the trouble is going to save you a heap of headaches. It may be the difference between a ruined engine through scored cylinders and pistons or shot bearings—or a minor overhaul of the oil pump or gauge—and one of these days this may mean the difference between

you getting back to base or getting struck out as a dead duck or a visitor to a prison camp".

"So it all boils down to a matter of saving your own selfish hide. All you've got to do is report anything wrong—so don't be afraid to. Those mechanics haven't a thing to do but take care of your truck and they'd sooner make a simple adjustment today than have to tear down a whole assembly next week."

"And you'll find it pays to take a pride in having an efficient vehicle —sure, it takes a bit of effort to check everything thoroughly—it's going to take a whole heap of effort on every one's part to get this war won and over with."

"Thanks—another the same."

Sgt. O'Sweat pauses to lubricate, then continues, "Well! That's the daily checks pretty well lined up—they're strickly the driver's responsibilities. Now C.P.M.S. 4—that's the thousand mile inspection and check by the unit motor mechanic—and the driver is in on that too. The number four form, just like 1, 2 and 3 covers all the items to be checked and naturally is more searching than the daily checkups. Usually there's something requiring attention and so it's a good idea for the driver to not go picking daisies while these checks are being made—but to have his nose in on the whole thing—see that the defects are noted and repaired either by the Unit Motor mechanic or marked for the Ordnance Workshop. The N.C.O. in charge will determine this from the Permissive Repair Schedule. And incidently, by acting as the mechanic's helper the driver can learn a thing or two more than he knew before about the innards of his vehicle. And here, and certainly later at the 5000 mile check is where the sins of the driver might catch up to him. Bad driving habits, incorrect employment of the vehicle or obvious neglect or misuse are simple things to detect by a good mechanic—they just bang him right between the eyes. But he's not going to let that sort of thing break his heart. He's got to fix the damage, sure—but he's going to try and see that the vehicle doesn't come back in a month or so in the same shape—you're the driver—so you're it. That truck is still your responsibility, remember? Which gets us right back to those daily checks—they're your best pals in helping you keep your vehicle better than the other guys—they are the foundation of the whole thing. Catch those little troubles early and you won't run into the big ones—that calls for nothing more complicated than plain horse sense."

"Oh yeh—a little birdie tells me that a new C.P.M.S. form will be coming along soon that's even simpler than the one you have now. All three checks are on the one side of the sheet—on the back of your trip sheet—that cuts out one more piece of paper you had to find room for. A new Driver's Handbook that covers just about everything goes with the new form—so, as the preacher's say—all you've got to do is follow what the good book says and you and your truck will live happy ever after."

★ ★ ★

In the Mail.....

Seems there was a class being conducted by one of the big Automotive Manufacturers on driver instruction. Seems, too, that the service representatives were rudely shocked by the answers to some of their questions. They were working on the C.P.M.S. angle and got as far as the first item No. 1—1 "Vehicle in General", when some of the boys from one unit advised that their corporal had issued instructions to add oil whenever the level dropped below the full mark on the dip-stick. They were adding oil every few days. Now YOU fellows know the story on the "running level" mark, but we'll just whisper it anyhow—you don't need to add oil 'til the level is down to the bottom of "the safe driving range"—or 'til it gets near the line marked "Danger".

It also came out in the wash that one unit has a Dodge ration truck that makes a run every day between two towns about 40 miles apart—and about twice a week they find it necessary to install a new universal joint dust cover—twice a week . . . ! Why? Because the lads use a grease gun when lubricating the joint and force enough grease through until the leather boot is half full. The weight of the grease and centrifugal force does the rest—one or two trips and the boot 'blows'.

If you're still wondering about these universal joints on the Chrysler and Dodge commercial type vehicles, station wagons and cars, take a looksee at Service Information Bulletin G-3—it came out in September and imparts the information that these vehicles have trunnion type universals which are lubricated when they are assembled at the factory and should not require attention for 15,000 miles of ordinary driving. If you operate on lots of gravel, it's a good idea to look at the boots regularly to check for damage by flying stones. Replace 'em immediately if damaged, before sand and dirt gets into the working parts.

A SAD STORY ABOUT GREASE

By Sarge O'Toole

Sure, pal, I know—you can catch more flies with honey. . . .

But who wants flies?

You can talk sweet, you can talk your teeth out—P.M. just don't mean a thing to these jokers.

Ever see a wheel with about half a keg of grease thrown into it from the universal joint?

Show it to these monkeys and right away they holler "The oil seals ain't no good!"

The oil seals! You put enough pressure behind Boulder Dam and it'll break.

That's what they do—fill up the universal joint till it screams uncle. What's more, they use a lube that's too light.

Then, when the joint starts moving the grease gets warm, and starts spreading.

When you gotta go, you gotta go. That's what the grease does. It goes right along the shaft, squirts around the corner and goes up to the wheel bearing oil seal, busts through it and keeps right on going—into the brakes.

With the pumpin' action in the universal it ain't no time at all 'til it gets pumped clean of lube.

Goodbye, universal joint. Goodbye, brake linings. Goodbye, oil seals.

I tell my dough-heads a million times — pack the universal with D.N.D. No. 672 all year 'round. Then all you have to do is give her a few shots every 500 miles—being sure to stop when the grease starts coming out.

Do they hear me? Go talk to a brick wall! Or, if they do, by some freak of nature remember that—then they pull another fancy trick. They stick too much lube in the differential. What happens? Oh, nothing much. Just that the stuff expands, busts through the oil seal leading from the differential and spills into the universal joint.

You take it from there. The universal is now too full of grease so the grease busts through the front bearing seal and dives into the brake again.

Eat your heart out.

"Gentlemen", I say, "always keep the goo at the proper level in the differential, grease at the proper level in the U joint, and pack wheel bearings properly."

"And further more, gentlemen, ★★○%○★★."

SAM

With apologies to Stanley Holloway

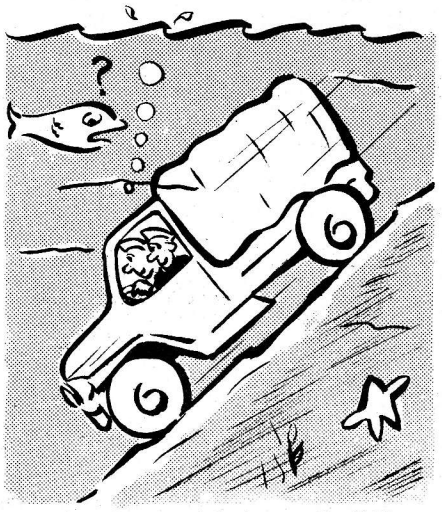
It were over what's called lubrication
That 'im and the "Sarge" ad a split,
'E were bungin' some grease in a nipple
Wi' a gun wot were covered wi' grit.

The Sergeant went purple wi' passion
An' pretty nigh speechless wi' rage,
But 'e managed to call 'im a wotsit
Who'd sprung from obscure parentage.

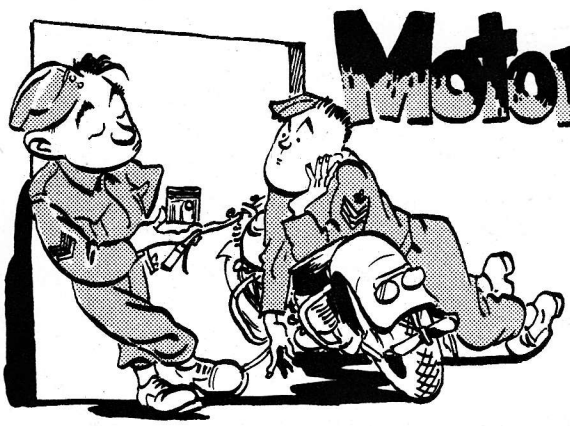
'E says, "If that muck get in bushin'
It'll tear it to Satan's abode—
I've told yer ter clean them utensils
Yer perishin' son of a Toad."

"Further more, while we're on this 'ere subject,
And before yer begins with yer tool,
Just see as them nipples is spotless
And clean to let grease through, yer fool".

"And just keep the lids on t'containers
While they're sweepin' oop rubbish an' all
Cos' grit sticks ter grease like the Ivy
Wot clings to' old garden wall."



Sure he said turn left?



Staff Sergeant Cranberry and Sergeant Hutch were standing in the sun near the door of the Motorcycle shop. Sgt. Cranberry had a hang-dog expression on his face and Sgt. Hutch was down in the mouth too.

Both boys were in fine shape.

"Say," suddenly popped Sgt. Cranberry, "What's that you got in your hand?"

"Oh these," said Sgt. Hutch, "These are pistons that got ruined by ignorant m'cycle riders whose names are legion."

"That's a funny name for ignorant m'cycle riders," puzzled Sgt. Cranberry. "I can think of a couple of choicer names. But pray tell, how come those pistons in your hand are so eaten, beaten and chewed? Was it lack of oil in the engine?"

"No," said Sgt. Hutch, "it was a loose nut—sitting in the saddle. There was plenty of oil in the engine. T'was something else."

"T'was?"

"Yeah", said Sgt. Hutch, "these pistons got ruined by riders who didn't know enough to snap off the throttle every mile or so when riding **long distances** at **high speed.**"

"As you and I know, the oiling system on a m'cycle is different from a truck. M'cycle crankcases are airtight and full of vacuum and vaporized oil that's being flung about by the flywheel. When the piston goes up, it makes a stiffer vacuum at the top and the vaporized oil rushes up and soaks the skirts of the piston and the cylinder."

"But . . . . ?" prompted Sgt. Cranberry.

"But," continued Sgt. Hutch, "at high speeds there's a lot of pressure in the Combustion Chamber on top of the piston—and some of this blows by. Blows by and kills some of the vacuum in the crankcase—which prevents the oil from being drawn up around the pistons and cylinder walls. This is one of the reasons why the pistons and rings run dry and dash themselves to pieces."

"Murder," agreed Sgt. Cranberry, "and to think all a rider has to do is cut off his throttle for a second every mile or so, especially those guys on the open highway in convoy.

"And by the way", says Sgt. Cranberry, "have you heard what some of these chuckleheads are using to lubricate m'cycle transmissions?"

" . . . . ?" said Sgt. Hutch.

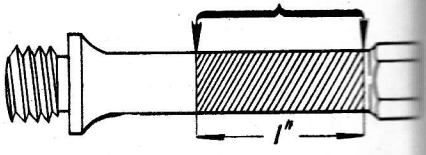
"No," said Sgt. Cranberry, "but you're close. They're using D.N.D. 390 and even Hypoid differential grease—stuff so thick they must be cutting chunks of it off with scissors and ramming it down into the gear boxes. Why the stuff's like taffy! ! ! and they're using it to lubricate those close fitting little needle bearings in the Harley-Davidson gear box! Why, some of those parts are no bigger than fountain pen parts".

"True, oh great one," mourned Sgt. Cranberry, "in any case, if they took the trouble to check their Canadian Army Lubrication Guide they'd see that D.N.D. 390 is the heaviest lube they should ever use—right on the Lubrication Guide in black and white. They'd also notice that you use the same oil in the gear box as in the engine—that's all they got to remember."

"Ah, the only memory some of these toads got is for food".

"Now", said Sgt. Cranberry, sadly fingering a ruined piston, "you're cooking with gas!"

The filler plug on the Harley-Davidson (Model WLC) gear box has been sticking its long neck out and getting into plenty of trouble. If the bike happens to get dropped on its right side, the plug has a habit of hitting the ground, or a handy rock, placed there 'in lieu of', and bang goes another transmission case. As you no doubt have noticed, the plug is threaded into an aluminum neck extending out from the transmission case and being of considerably stronger material than aluminum the worst always happens. Some of the Heavy Handed Lads have even managed to crack the transmission



Diagrammatic sketch showing filler plug before operation takes place.

case in the process of undoing the plug—as there is a tendency for the plug to stick quite tight (particularly if the oil level hasn't been checked as regularly as Canadian Army Lubrication Guide M.C.

(Continued on Next Page)

Trouble Shooting

ON HYDRAULIC BRAKES

Here's a handy list of symptoms that will help you diagnose hydraulic-brake ills.

1. When all brakes drag, look for: Incorrect adjustment of shoes; mineral or other improper fluid in system; defective rubber piston cups and valves; pedal not returning to full off position; clogged compensating port in master cylinder.

2. When one wheel drags, look for: Weak or broken brake shoe return springs, incorrect shoe adjustment; defective wheel cylinder piston cups; loose or defective wheel bearings; stuck wheel-cylinder piston.

3. When brake pedal goes to floor board, look for: Excessive clearance between brake shoes and drums; worn brake lining; air in hydraulic system; leak in hydraulic system.

4. Excessive pedal pressure is caused by: Warped brake shoes; grease-soaked lining; incorrect shoe adjustment; egg-shaped drums.

5. When vehicle pulls to one side, look for: Different kinds of lining on opposite wheels; grease-soaked lining; incorrect adjustment of anchor pin; primary and secondary shoes reversed on one wheel; loose wheels; unequally inflated tires; tires worn unequally; scored brake drums; dust or other foreign material between drum and lining; weak chassis springs; defective or weak shock absorbers; rough brake drums.

6. Excessive pedal action is caused by: Incorrect brake shoe adjustment; scored brake drums; incorrect lining; loose brake backing plate.

7. Spongy brake pedal is caused by: Air in system; incorrect brake shoe adjustment.

8. Squeaking brakes are caused by: Warped brake shoes; loose lining; dirt imbedded in lining.

Mineral oil or other improper fluid, and all foreign matter are poison to the hydraulic brake system. Don't leave parts near or clean them with anything but hydraulic brake fluid or alcohol.

"Handle with care" is the first prescription when doctoring the hydraulic brake system. So . . . .

(a) Storing brake fluid and flexible parts near steam pipes or other hot spots deteriorates them.

(b) Keep sharp tools away from rubber parts.

(c) Keep oil and grease away from brake linings and shoes.

(d) When assembling shoes against wheel cylinder make sure shoe toe is properly located in piston insert slot.

(e) Don't use more than a 5" wrench on tube nuts or fittings or bleeder screws. Anything more than ordinary pressure is not required.

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MOTORCYCLES—(Cont'd)

was it should be.) The cure for the latter is to strike sharply, with any handy blunt instrument, the head of the Heavy Handed Lad and conceal the body under a handy bench, and the first trouble can be fixed even more easily. Simply remove 1" (one inch) from the neck of the plug nearest the hex head and weld the head back onto the base. All the lurid details of the job are contained in a recent modification bulletin (Motorcycles, K-1)—take a look at it right away and get a quick and easy job done before it becomes a long and expensive one. We understand the latest machines are fitted with the short filler plug in production.

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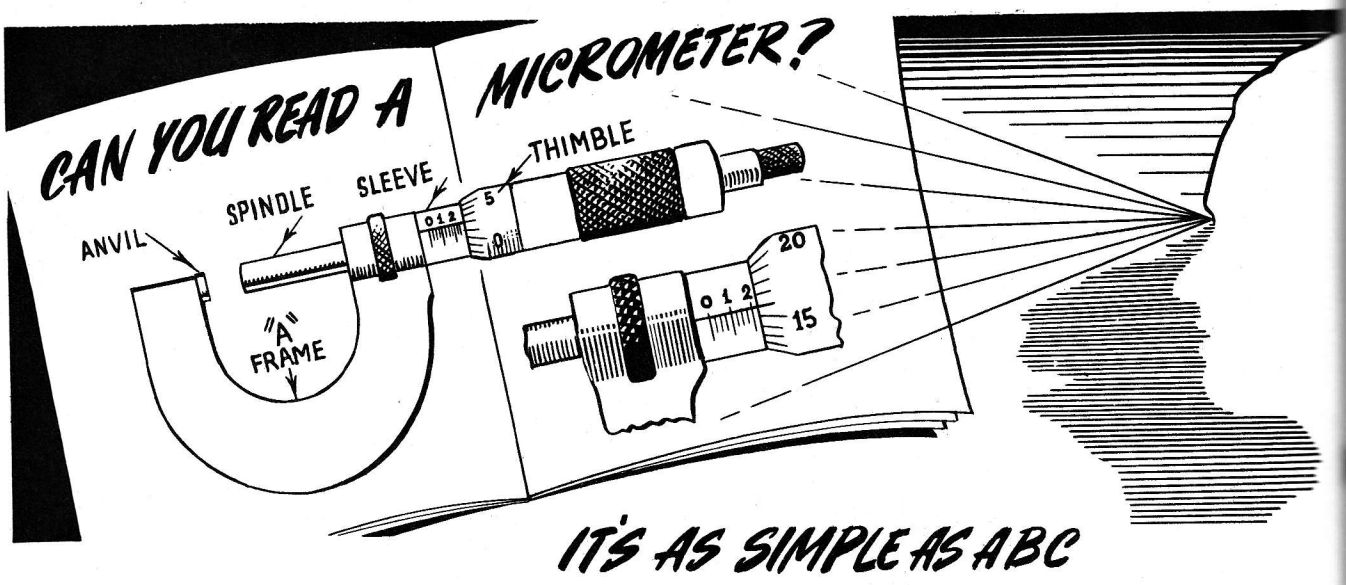

Precision machining is as dependent on the micrometer as an arch on its keystone. The fine clearances in modern engines are possible only because of the micrometer's infallible accuracy.

Yet an amazing number of people (don't blush . . . you have lots of company) haven't learned to use one because they think it takes a combination of supernatural power and black magic to coax a proper reading out of a harmless little mike.

First off, lets **you** call it a mike too. That makes it much less forbidding. The next thing is to negotiate one out of the shop sergeant's pocket. If he's too fast for you, pretend you were just checking up to see if he'd miss it. If it comes to the worst, let him chain you to the drill press while you learn how to use the mike following these directions.

O.K. Now hold it firmly (they don't bite) and look it over. Is it an inside mike or an outside mike? If it's like the one in the picture it's an outside mike. But they're both read alike, the only difference is, one makes inside measurements like cylinder bores, bearings, and so on; the outside mike gives readings on pistons, shafts, journals.

Look at the picture to find out what we mean when we say Anvil, Sleeve, Thimble or Spindle. You don't have to name them every time you take a reading, but you've got to put the thing you want to measure between the right parts.

Now let's investigate the hodge podge of little numbers and lines that are jumping all around in front of you.

Look at the lines on the thimble. Each one, starting with the first one above the zero, stands for one-thousandth of an inch (written .001). As you turn the thimble, each time one of the little lines comes even with the horizontal line on the sleeve it means you've moved the spindle .001 toward or away from the anvil. Got it? All right, let's send the spindle all the way down to the anvil and start reading as we open 'er up.

The first line you reach on the thimble, as you already know, is .001, the second is .002, the third .003, and so on 'til you get all the way round the thimble to zero again. Now look down at the sleeve and you'll see a little vertic line peeping out from under th thimble. The vertical line stand for twenty-five thousandths of a inch (written .025) and if you notice, you've reached the twenty fifth line on the thimble. Now a you keep turning and the thimbl moves up the sleeve you'll notic that every fourth line on the sleev has a number above it: 1, 2, 3, 4 5, and so on up the line. Each o these numbers represents 100 on thousandths of an inch or .10 (one tenth if you want to say it tha way), which makes sense becaus you can see it takes four comple turns of the thimble to reach eac of the numbered lines.

Now let's set our mike like th one in the picture, and take ou first reading. The edge of th thimble is a little to the right of th first line on the sleeve past the lin marked with Figure 2. Knowin that this stands for .200 let's jot i on a scrap of paper just that way then because we remember tha the line to the right of the lin marked 2 stands for .025 let's ju that down under the first figur Next we note the graduations on th thimble and sure enough we're a

the first line above 15 which we note on our pad as .016. The figures on your pad should look exactly like this:

.200
.025
.016

and added properly make a total of .241.

Why of course it's easy, what makes us think there was anything tough about it in the first place? Oh, that rumour-monger over there out, did he? Well, you just give him the special treatment the Army reserves for all rumour-mongers. And let that be a lesson. Don't assume there's anything **you** can't do until you've tried.

Of course you'll want to get this thing down pat before you forget all you've learned, so pick up a few odds and ends of metal and make sway at them; but bear in mind that the mike is a delicately adjusted precision instrument and shouldn't be bounced around on the floor. So you'll want to avoid turning the spindle too tightly against the work being measured. Some mikes have a safety ratchet which starts clicking when you have the proper fit, others don't, so treat it as if **you** had paid for it.

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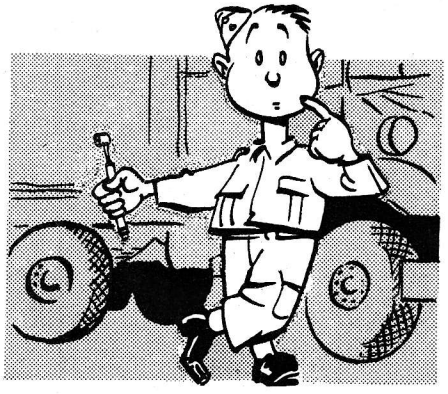
BLEEDING FIENDS BLOW TIRES!

Bleeding of tires is a practice used by the uninitiated to adjust pressure during a long-run. It works like this—one Pte. John Dumjon, driver, starts out early one morning to show the boys a thing or two about maintenance. It is the cool beginning of a fine, summer day, with the temperature about 82°. The truck has almost-new 1200 x 20 tires, and the pressure at the before-operation inspection is fine—70 lbs. So, our hero starts off at 40 miles per hour.



At 100 miles he stops for lunch. His momma done tole him tires oughta be checked, so he does and finds the left front tire at 85 lbs. Naturally, he doesn't know that the temperature is 214° in the tire, but he does know that the figure on the door panel says 70 lbs. (Too bad so many people can read without thinking.) So, he bleeds the tire to 70 lbs., thereby reducing the temperature from 214 to 198 degrees, temporarily.

One hundred forty miles later he stops again and finds that the pressure in that tire is now 74½ lbs. Carramba! he says, and bleeds it down to 70 lbs. and from 229 to 221 degrees, while silently cogitating as to why his gas tank doesn't get fuller of gas like his tires get fuller and fuller of air.

So—50 miles farther on his tires reach a temperature of 252° very near the curing temperature of the tire. The elasticity is fatally affected, and bingo, the tire blows, and at only 73 lbs. of pressure.

Seriously speaking, the point is this: Any adjustment of tire pressures should only be made when the tire is at normal temperature. Tires are built to stand the increased pressure due to increased temperature over normal, long runs. Admitted, that long runs on hot days are hard on tires. BUT—bleeding of the increased pressure has just exactly the wrong effect—the greater flexing caused by bleeding generates more heat, the tire reaches the critical temperature, and . . . . BANG!

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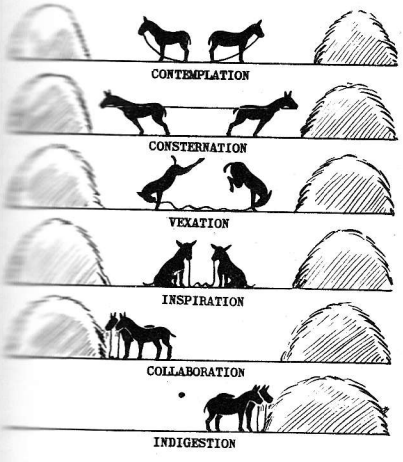


It ain't Hay!

Here is a spot of whimsey with a moral. To us it's a symbol of co-operation between the lower echelons and the higher echelons. The drivers faithfully performing their C.P.M.Ss.—the mechanics in the workshops glancing up gratefully from their labours in repair and overhaul.

Look it over. Take it to heart. Don't think it portrays the 1st, 2nd, 3rd and 4th echelons as a bunch of horses hooves always looking for something to eat (which of course they are—(looking for something to eat, we mean)). Think of it as the joining together of all echelons in a common effort, benefiting themselves by benefiting the other. Finally sweeping on to harvest the fruits of victory.

Which, incidently, ain't hay. No kidding, boys!

SAFE WINCH OPERATION

Treat your winch like a woman . . . with care and respect

How many of you have seen the end of a broken winch line fly through the air? It can cut off a leg as clean as a surgeon's knife. It can crush a man's head or chest as easily as a boy can smash a bird's egg. And there's no time to jump after the line breaks: hardly time for a quick prayer even if you are watching it.

WINCH LINES STRETCH LIKE RUBBER

A winch line under load stretches like a rubber band and stores up a lot of energy; just like the sling shot you made not so long ago. Remember how fast a stone would fly from it, especially when it was headed for Mrs. Plushbottom's window? Well, that sling shot weighed a couple of ounces, but a winch line will weigh from 50 to 200 pounds and steel is a much better spring than rubber. I don't know how the speed of a broken winch line snapping back compares with a rifle bullet, but at least the bullet makes a fairly clean hole. If you're the driver, duck down behind the cowl when a line breaks. The brush guard will stop it in most cases but a broken cable can do some funny things and playing safe isn't being a sissy. The idea is to treat a winch line under strain with the same respect you would a loaded gun. So . . .

STAY AWAY FROM WINCH LINES UNDER LOAD

If a snatch block is used, keep away from the angle made by the cable and the block. A winch line makes a swell sling shot. I have seen a 95 pound snatch block travel 300 yards on the fly and that's a lot farther than Babe Ruth could sock a 5 ounce baseball.

WIRE CABLE

Wire cable is the Prima Donna of the winch set up. It is as temperamental as Greta Garbo, and treating it carelessly is like asking Lana Turner to scrub the kitchen floor. A winch line has a tougher life than a soldier on K.P., so give it a chance. However, don't get the idea that this cable is a softy. It's strong and will take plenty of punishment, but even a tough guy will fold up when hit below the belt.

One of the quickest and easiest ways to ruin a length of cable is to put a kink in it. Keep your eye peeled for this when handling them. Only constant care will keep the kinks out.

To get proper life from a length of cable, wind it tightly and evenly on the drum. A loose cable will jam down between the coils and cut and even break the surface wires. This seriously weakens the cable and makes it dangerous to handle. It damages the wires and spreads the strands so water can get in and cause rust.

REWIND THE CABLE CAREFULLY

After using the winch, wind the cable on the drum with at least two men hanging on the end to give it some tension. At the first opportunity completely unwind and rewind it under tension.

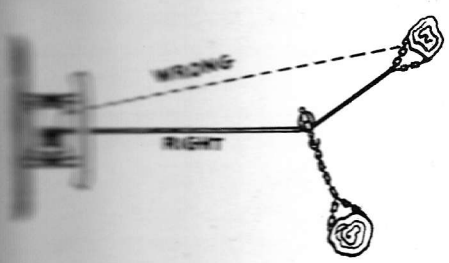
The best way to do this is to fasten the end of the line to the front bumper of another truck that is properly lined up with the winch. The driver of this truck should keep a slight even pressure on his foot brake and allow the winch to pull his truck. Winding on the first layer is the most important. The coils of cable must be tight against each other so the coils on the next layer cannot jam down between them. As the cable is wound on, it should be tapped every few inches with a hammer. Use a block of wood between the hammer and the cable to avoid flattening the wires. After the first layer is wound properly, the rest is easy, for the cable has to be guided only at the beginning and end of each layer, provided the trucks are kept lined up properly.

If another truck is not available the same result can be obtained

by fastening the end of the winch line to a tree and letting the winch pull the lightly braked winch truck to the tree.

This may sound like a lot of work but don't say, "Oh yeah", try it once and will pay big dividends in cable life, to say nothing of your own.

Whenever the winch line looks dry or shows signs of rusting (but why wait that long), give it a dose of engine oil (crank case drainings do very well). Some cables have an internal lubricating core but most have to be lubricated by external application of oil. When



a rope bends there is a slight movement between the wires, and the oil will reduce the internal wear.

WINCH DRAG BRAKE

Most complaints about the winch drag brake are made because its purpose is not understood. The drag brake is there for one reason only: to keep the drum from turning when the jaw clutch is out and the cable is being pulled off the drum. If the drum is allowed to turn free, the cable will get tangled, and become damaged.

Under no conditions ever attempt to lower even a light load on the drag brake.

When the winch is not in use leave the jaw clutch engaged to keep the cable tight on the drum and be sure to lock power take off in neutral. Don't tighten the drag brake to keep the cable tight on the drum while the truck is being driven, because you'll have a tough job pulling the rope off when you want to use the winch.

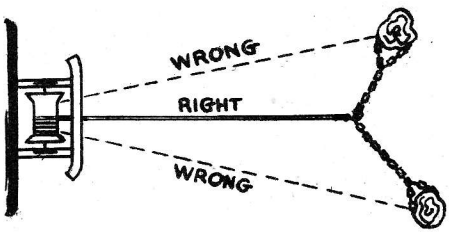
If the brake does not work smoothly and evenly, there is probably paint on the drum flange. Remove the paint from the part of the flange covered by the brake and it should work properly.

RIGGING

Anchoring the far end of the rope properly is very important. Fastening the hook over the wire cable after putting it around a tree or other anchorage will seriously bend and cut the strands. Slip the hook through the chain on the end of the cable. Don't fasten the cable to an anchor by tying the winch line, except in emergency. The knot kinks and weakens the cable and it is almost sure to slip.

APPLY LOADS SLOWLY

Always apply the load slowly. As the cable starts to tighten, make a final check for proper alignment, the setting of the snatch block, and see that the cable is not rubbing on anything. Then set your engine at about one quarter throttle and let in your clutch slowly. If there's a tachometer keep the reading under 1000 r.p.m. Loads suddenly applied, called shock loads, cause



twice the strain on the mechanism. This will probably mean a broken shear pin if one is fitted—or the line might go. Make the driver who pulls this one climb down into the mud to change the pin and he'll not do it again.

OUT BY THE BOOT STRAPS

When pulling your own truck with the winch, anchor to something exactly in line with the direction you want to go, using your snatch block if necessary to accomplish this. Angle pulls tend to pile the cable up at one end of the drum. If it builds up above the top of the drum flange it will climb over and jam down between the drum and the gear case or around the sliding clutch. This ruins the winch line and may severely damage the winch. Always detail one man to watch for this from a safe distance.

When the cable starts to pull up, either change the line-up by steering in the direction the cable is piling up or, if this is not possible, stop the pull and change the anchor for the winch line.

In pulling out another vehicle, it is always possible to line up exactly, either with the vehicle to be pulled or with a snatch block used for this purpose. It takes only a few moments extra to line up right and may save a lot of time and trouble later.

Always be sure that the rope is not rubbing against rocks, gravel, or metal. If you really want to cut the cable a cold chisel is easier but no quicker.

In tough pulls, anchor as far away from the winch as you can to get as much line off the drum as possible. On a 30 cwt, or 3 ton truck the shear pin, electric torque limiting device, or maybe the cable will let go at about 10,000 pounds pull when the winch line is on the first layer, but they might go at 5,000 pounds when the drum is full. So take the hint and save yourself the trouble of getting out and under to change a shear pin. But never run winch cable **too** far off the drum. It's a hell of a job to put it back on. Leave at least four feet on—a daub of red paint on the cable will indicate the crucial point.

SNATCH BLOCKS

Proper precautions in the use of snatch blocks are very important. When you lead a line around a corner with a snatch block, the strain on the hook can be much more than the strain on the wire. If you bring the cable back to where you started from, a 10,000 pound strain on it puts a 20,000 pound strain on the block. If the cable makes a right angle around the block, a 10,000 pound strain on the line puts over 14,000 pounds on the block. Who cares? Well you ought to, because the rigging to hold the block should be twice as strong as the cable, otherwise, you will have some blocks flying through the air. When the snatch block changes the direction of the cable 90 degrees or more, wrap your utility chain twice around the tree or other anchor and place the hook of the block through both loops of the chain.

SOME TIPS

After all this spiel, here are ten simple tips that will make things easier for the boys in the repair echelons and the Medical Corps:

(1) Know your servicing procedure and do your C.P.M.S.'s carefully on truck mounted winches.
(2) Keep away from winch lines.
(3) Keep out of the angle made by the winch line and the snatch block.
(4) Be sure there are never any kinks in the line.
(5) Line the truck up properly before starting to pull.
(6) Check the setting of the snatch block.
(7) Watch the winch line, block and anchors for signs of overload.
(8) Keep the cable properly and evenly wound on the drum.
(9) Apply load slowly and evenly.
(10) Watch the winch line for broken wires, localized wear, or broken strands.

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Where credit is due

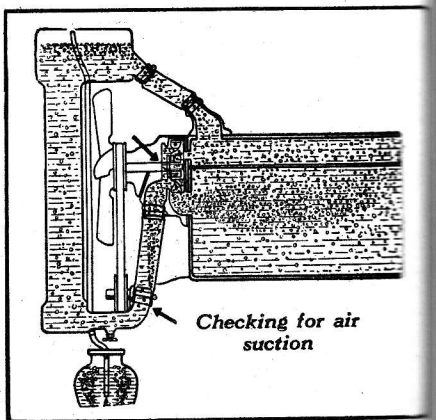
In the preparation of "CAM," we are greatly indebted to our American friends for their kindness in granting permission for us to reprint material from Army Motors and other technical publications issued by the United States Army.

MORE ABOUT COOLING SYSTEMS

Aeration, or mixing air with water, speeds up rust formation as much as 30 times according to tests, and increases corrosion of all cooling system metals. Clogging and corrosion go hand in hand with water pump leakage and aeration.

Besides speeding up corrosion, air sucked into the cooling system may cause serious foaming, overflow, loss of coolant and overheating.

Where rusty coolant, severe rust clogging, corrosion or overflow losses are encountered, the cooling system should be checked for air suction and aeration. Here's a simple, quick test for air suction:—



Checking for air suction

Adjust liquid level in radiator allowing room for expansion so as to avoid any overflow loss during test. Be sure radiator cap is on **air tight.** With pressure cap block open valve, or replace with plain cap. Attach a length of rubber tube to lower end of overflow pipe. All connections must be air tight. Run engine in neutral at safe high speed until temperature stops rising and remains stationary. Without changing engine speed put end of rubber tube into a bottle of water, avoiding kinks that might block flow of air and watch for bubbles in water bottle. The continuous appearance of bubbles is the tip off on air being sucked into the cooling system.

TURRET TALK

"NO, NO, A THOUSAND TIMES NO - - DON'T USE THE ENGINE FOR A BRAKE!"

This—that's not what you were ever taught mebbe—but it's the straight goods just the same—especially on low geared vehicles like the Lynx I (Ford Scout Car) Otter I (G.M. Armoured Cars) and Otter I (G.M. Reconnaissance), and even more especially tanks!

Why? Lend me your ear buddy, and I'll expound. First — it's a matter of RPMs. Every engine is designed to produce a certain number of them—if it exceeds this maximum, things are going to cook or bust. The clutch is in the same boat—it will carry the same RPM as the motor and transmit the maximum torque the engine is designed to produce. Top those figures and the clutch will go places rapidly. Propeller shafts and universal joints are just as particular as how fast they have to get around.

Now let's look at some figures—don't like that blon . . . Say the gear ratio between the input shaft of the transmission and the output shaft to the transfer case—in second gear, is approx. 3 to 1—that is, it takes 3 revolutions of the engine to make the transmission output shaft revolve once. From the transfer case to the rear axle via the propeller shaft goes our power where it takes 6 revolutions of the propeller shaft to turn the rear wheels once. So we've got 18 revolutions of the engine for one revolution of the back wheel. (This, of course, will vary with different types of A vehicles, but the principle's the same). Now, we're poppin' along a highway at 25 m.p.h. in high gear. Our rear wheels are doing about 245 RPM. Suddenly, the driver sees his favourite chick out with another guy and shifts from fourth to second to slow down fast. His size 14's don't even go near that brake pedal. Does he give a hoot if his propeller shaft is making 1470 RPM? Not on your life—so when he lets in that clutch he forces his engine and clutch to jive to the tune of 4410 RPM equivalent to a road speed in high of 75 m.p.h.—Heavens-to-Betsy! he's now got the engine and the clutch doing 1500 RPM more than they were designed for. If he used his head for more than holding his ears apart he'd visualize those engine main bearings, con rod bearings and the whole power train catching Hallelujah! Maybe he's lucky this time and everything holds together —but the wear is increased something fierce and one of these days —sploft! Expensive sounding, wot?

There are several other reasons why the practice of shifting down everytime you want to slow or stop is definitely ungood. Gas wastage, lack of control at a critical time—but like most 'rules, there are the exceptions. Obviously, complete brake failure calls for emergency action with the gears. Stopping on icy roads is another occasion when it's the right procedure—tho' your speed should be low enough to not cause excessive strains on the transmission.

Descending a steep grade is still another occasion for gearing down —but paste this inside your hat: "Get into lower gear at the **top** of the grade!"

When you coast downhill with the clutch disengaged, boy! you're sittin' on dynamite. Sure—you save gas, make time, and everybody's happy as pigs in sunshine.

Then something happens. You're rolling too fast—comes a radio to "Halt!"—a road-block behind a curve—any of a dozen things—slam on the brakes? Bang in the clutch? Yell for the boys to drag their feet? So you gun her, shift down, and it sounds like sawing through a railroad spike. But you get her whoa-ed. Somebody thinks they smell smoke, and you all bet beers which is it—brakes or clutch? Nobody wins, because it's both.

Anyhoo, don't believe us. Just keep on beatin' the pis-tons out of your rig—she'll take it. (But not for long). Some morning, when you say "Take a gander at P for Petunia, sergeant-major. The motor goes, I can shift, but it just grinds and won't take off"—remember we told you: "DON'T USE THE ENGINE FOR A BRAKE!"

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For B.F.s

"This must be meant for you, Chum."

This is the first of a series of articles for B.F's. That being so, we cannot possibly understand why you, of all people, should be reading it. We can only assume that you opened the book here by mistake, as though whoever passed it on thought you'd be interested in some of the damfool things **other** people do.

However, we'll get on with what we were going to say. The first question that might be asked is "What is a B.F.?" Gather round, boys, while we make it clear. Put simply a B.F. is—but why should **we** bother to tell **you.** You've a sergeant of your own, haven't you? Let's leave it at that.

The next question is "Who is a B.F.?" A B.F. (shall we say) is always the other fellow until someone finds us out. We hope you won't take that the wrong way. We feel pretty sure you won't. But just in case anyone else should, we apologize here and now to every driver in the Canadian Army who measures more than 4' 6" in his socks.

What it boils down to is this. There are all kinds and degrees of B.F's. Some are B.F's all the time. Some are B.F's part of the time. Some are B.F's only occasionally. These articles may help a few of them to graduate into the next class. They explain a lot of things in simple and homey language—and we believe that even the "only occasional B.Fs" will find something useful in them.

You needn't own up to the fact, of course. Once you have read the article (and resolved to avoid some of the B.F. habits in future) you can pass it on to a friend and say "This must be meant for you, chum."

We don't mind, and we hope the friend won't. We shall be happy if **no one** owns up to reading them, so long as **everyone** learns a bit more about his vehicle and how to treat it.

TIPS ON TOPPING UP . . .

It used to be said—it probably still is—that any fool can pour water into a radiator. There must be some truth in the statement or the Army would have made it a workshop job years ago.

But even in the simplest of tasks one learns a wrinkle or two from experience. You know, of course, that you're supposed to use **soft** water when it's available. You know, too, that if you have to use a bucket of ditch-water in an emergency, it is best to remove the dead leaves, old boots and other "foreign bodies" before you pour it in. But that doesn't exhaust the subject by a long way.

Suppose, through a defective joint or something like that, the radiator runs nearly dry. Things begin to smell a bit hot. The engine seems to stiffen up. After a time it begins to knock—so loudly perhaps that you wake up and start to realize that something isn't quite as it should be.

"Remove the dead leaves and other 'foreign bodies'."

"Hm!" you say, "short of water." And you pull up, undo the cap and peer inside.

Well, you learn something right away. First that steam is hot, and second that it isn't wise to push your face into a column of it unless you really want to look like a lobster.

That, one might say, is Lesson No. 1. Lesson No. 2 follows almost immediately. You procure a bucket of water, and keeping your face out of the way this time, you proceed to pour it in. All at once, there is a rending sound, another jet of steam and a loud and expensive-sounding crack.

You look blank—no, let's say your expression changes—and you wonder what you've done. We'll tell you. You've carried out an experiment in rapid expansion and contraction. **You've cracked the cylinder head.** And that makes you another that are useless to the Army.

"You learn something right away."

Maybe you haven't done it yet. In which case, don't. **Never** pour cold water into an overheated engine. What happens to your face is your own concern, but it's no end of a pity to spoil a good cylinder head.

SEVEN RULES for SAVIN' TOOLS

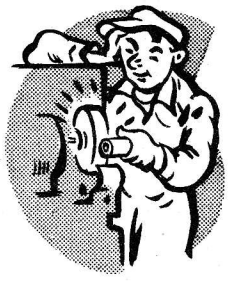
Never hammer a ratchet. Soak the nut with penetrating oil to ease both fit and turning.

The leverage that can be applied to a ratchet is limited. Watch those extension handles!

Never use a screwdriver as a pry bar—if you expect to keep on using it as a screwdriver.

"Don't look now—but you can see that boiler gauge reading. That chump's using it as a screwdriver."

See that a socket goes all the way down. If it's not fully seated you'll crack it like an egg.



Don't whittle down a socket to get into a tight place—whittling weakens the walls.

Heat crystallizes metal; ruins the temper. Keep your tools away from flame and high voltage.

Who dat knocking at mah door?

Would You be so Foolish as to Drop a Pan to Stop a Carbon Knock?

(Come, come, answer the man's question, Refael).

It happens that way lots of times. Carbon knocks can sound like loose connecting-rod bearings. And when the mechanic who decides that it's the bearings knocking at his door, snatches off the pan and can't find any missing babbitt, there's a new candidate for the Royal Order of the Burned Buttresses.

Carbon can cause more than one kind of knock—and that's what fools you. Everybody has heard the "carbon-knock", "spark-knock", "pre-ignition-knock", "detonation-knock" as different people are fond of calling it. But in every case, this is merely the rattling or clicking that occurs when the engine is under load. It's caused by fast timing, low-octane fuel, or a reduced area in the firing chamber—the result of carbon deposits—which raises the compression.

The carbon knock we're talking about is different. It's caused by layers of carbon formed on the piston head, banging up against the top of the firing chamber.

Never thought of that before, did you?

Carbon is a second cousin to the diamond; and when it's thoroughly heat-treated and hardened, it's a first-class hammer. It builds up layer by layer on the piston and the cylinder head from the oil by-passed into the firing chamber from around the valve guides and piston rings. The heat of the exploding fuel tempers it until it becomes a solid to be reckoned with.

When there's enough of it built up to beat against the top of the firing chamber, the driver, frightened by the ominous knocking from under the hood, cuts his switch and makes a mad dash to check the oil level.

When he finds it okay, he heaves a sigh of relief, says, "Well, they can't pin that one on me," and has his vehicle towed to the shop.

Back at the shop, the mechanic starts the engine, throttles it up and down a couple of times—calls it a burned out or loose bearing and starts on the wrong side (the underside) of the engine to correct the trouble.

Time and talent wasted.

The secret in diagnosing the knock, is in the listening. Like our Uncle Lovelips used to say, "Many a knock sounds powerful—like many another knock . . . but there's always a difference."

And the way to catch the difference between a bearing and a carbon knock is this:

Take the throttle-arm between your fingers and quickly race the engine up to half-speed. Let it drop off—but before it reaches idle speed, race it up again three or four times. If your knock is pretty audible while you're jiggling the throttle upwards, the chances are you have a loose set of bearings.

But if the knock is rather light or inaudible during this test—give it the old carbon-knock test: Throttle the engine up to half or more speed slowly—then release it suddenly. If the knock appears strongest during the time the engine is losing speed, it's a safe bet you've got carbon deposits.

Bearings knock on the 'up-beat' and carbon knocks on the 'down-beat'.

A carbon-cleaning job is the prescription.

Usually an engine that builds up so much carbon that a knock results, is ready for rings, and a close inspection of the intake valve guides. But sometimes carbon builds up in an otherwise serviceable engine—so when compression is good, and oil consumption is normal, a carbon-cleaning job is all that's necessary.

That's all there is to it. However, as we mentioned before, many a mechanic learns even such a little thing by hard experience. Hearing a knock that resembles a bearing knock, he goes right to work wasting time.

The best part of a good mechanic is not a horny hand or a bloodshot eye—it's a sharp and wax-free ear.

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Jive Cats

What price hurry?

You rush and you rush and you rush—but what does it get you?

Willie McSwat jumps in a truck and goes on a five mile trip to replenish Company 'Bs' supply of tootsie rolls. He tears along at forty-five miles per hour and saves two minutes compared to going the five miles at thirty-five m.p.h. Two minutes saved! Of course, in battle, two minutes might mean an awful lot. But this guy was after tootsie rolls!

Just figure the waste of gas, oil and rubber . . . why tires wear out almost four times as fast at forty-five m.p.h., as they do at twenty-five m.p.h. The cost of running the average passenger car at thirty-five m.p.h. is 3.4 cents; at forty-five m.p.h., it's 5 cents; at fifty-five m.p.h. it's 7.90 cents. Take the passenger cars—for your truck it's a heck of a lot more.

Now don't get us wrong, fellas, we're not recommending slow speed all the time—the tactical situation determines the speed. With the jeep wheeling at a speed of fifty miles an hour, you should chase them at a speed of . . . um . . . ah . . . twenty sixty m.p.h.

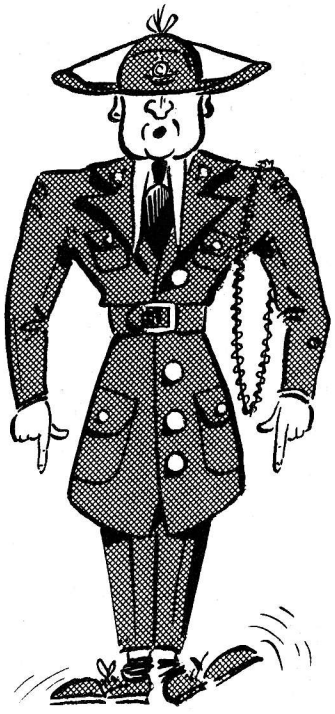
But with the tootsie rolls retreating at a speed of 0 miles per hour, there's not much sense in chasing them at a speed of forty-five m.p.h.

Now there's the gas pedal jitterbug. The gas pedal jitterbug wears issue two-tone saddle shoes, wool olive drab socks, and a one-and-a-half length uniform pant. You can spot the type of gas pedal jitterbug we mean while he's waiting for a red light to change. On the dance floor perhaps, this fellow is just a regular two-stepper, occasionally lapsing into a one and 7/8 step. But at the wheel of an Army vehicle, a sudden change comes over him. An anxious look comes into his eyes. You'll notice a twitch that starts at the shoulders but is suppressed until it reaches his feet—mostly his right foot. There, Sherlock, we have a gas pedal jitterbug! The driver can't wait that long—45 seconds for the light. He must have something to do. What will it be (as if you don't know)? Ah—he'll race the engine . . . then let it idle . . . then he'll race it again . . . and let it idle. Chug Chug . . . aroommmm . . . chug chug . . . arooooommmm . . . chug chug . . . arooommmmm, etc. Great sport this twitching, it helps you to pass the time while you're waiting. But pedal patting, if we may just whisper it, WASTES GAS! ! !

You know without any hints from us, that the engine idling speed is set low for gas economy. In tests made by a prominent manufacturer, at idling speed the engine on a 1½-ton truck consumed ¼ gallon of fuel an hour. If the truck made 150 stops a day, which is not abnormal for city driving, and the driver patted the accelerator only once in each of the one-five-o stops, **he wastes a half pint of fuel a DAY!** In a year, he wastes 19½ gallons of gas. But suppose he has the St. Vitus and beats out the conga about 5 times in each of the 150 stops. In a year **he wastes 97 gallons of gasoline.** (Your jaw should drop here).

Take that 97 gallons and multiply it by 20,000 army vehicles, and . . . it's a crime! A line of railroad tank cars stretching solidly for 2½ miles would be needed to haul the gas that would be wasted every year by Army drivers beating a tattoo on the gas pedal! . . . . 2½ miles!

Of course, this exact amount of gas is not wasted in a year. The Army does have good drivers, men who know which end is up, men who are smart enough to know that gasoline is like rubber—and it must be saved. Anyone can waste gas, easy as pie, and all of us, sergeants included, have unconsciously indulged in a little footloose caressing of the gas pedal. But just because you did it occasionally in the past, don't think that "tapioca" of the foot is an incurable disease. Next time you feel the urge, hold back that uneducated toe. Teach it the lesson of letting the engine always idle at regular idling speed, and you can take the credit for saving gas.



The NEW Army Issue ZOOT SUIT For Jitterbug Pedal-Patters

SALVAGE THAT CABLE!

One of our favourite war cries being "repair instead of replace" we hereby offer the tried and true method of renewing old battery cables. All you need for the job is a soldering iron, some solder, a blow torch and a new battery terminal (part No. 816994).

Of course the battery cable you're repairing has to be worth repair: it has to be long enough to make the connection without straining, the strands must be unbroken and in good shape—remember electricity has as much trouble going through a bad cable as water has going through a clogged pipe.

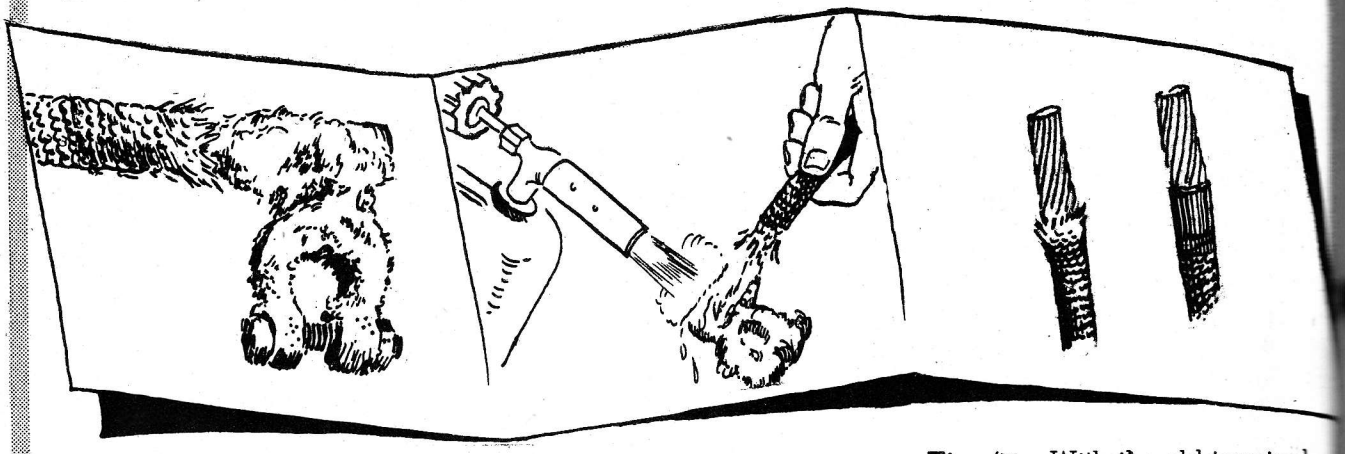


Fig. (1) Here's a battery cable so badly corroded (probably from spilled electrolyte) it looks like a beat up turkey neck. But a little smart repair can save it.

Fig. (2) The old terminal is beyond saving—The only thing to do is burn it off with a blow torch and throw what's left of it into the salvage bucket.

Fig. (3) With the old terminal burnt off, the exposed end of the cable should be scraped clean and the loose strands of insulation taped neatly to get them out of the way for the 'tinning' of the copper core.

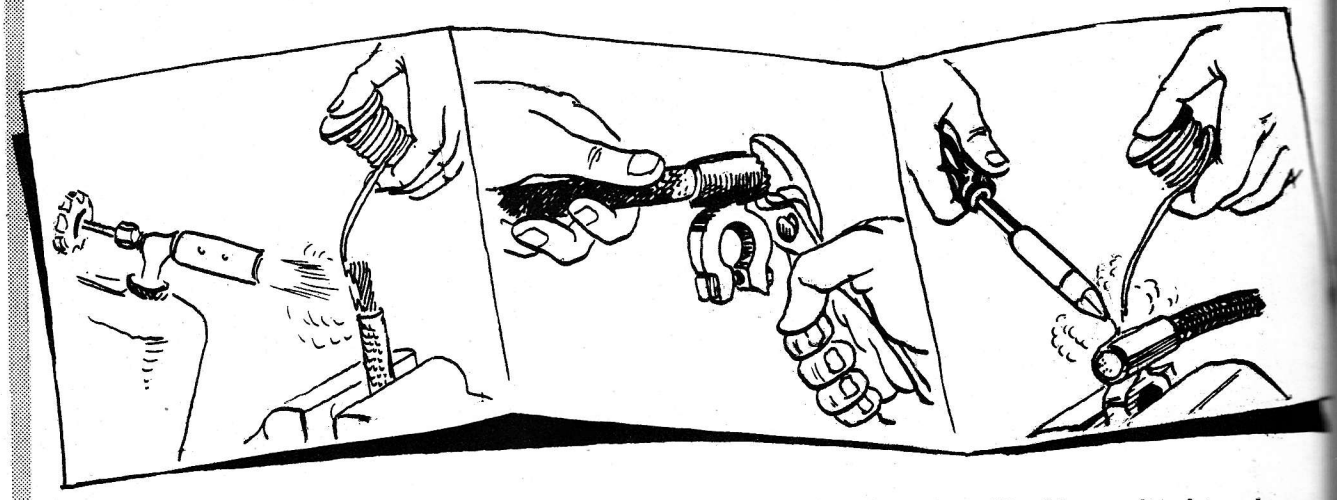


Fig. (4) 'Retinning'—a bare copper surface won't take solder very well (necessary in Fig. 6) so it has to be tinned. This means applying a very thin coating of solder by working the solder in well with a soldering iron.

Fig. (5) With the exposed core of the cable tinned, the new terminal is ready to be put on. There are two types of terminal. 1. The split barrel; 2. The closed barrel. The terminal shown is the split type. Put it on the cable and squeeze closed with pliers or in a vice.

Fig. (6) Now melt solder along the split and 'puddle' smooth with the soldering iron. If you've used a closed type terminal, heat the exposed end of the cable with the torch and insert into the terminal. The solder already in the terminal will fuse with the tinning job done on the cable. Plunge into cold water to cool off.

THIS IS YOUR BABY!

Each month will bring this little package from —the mailman.

Your contributions of ideas, articles and illustrations are welcomed with open arms (being of a naturally lazy disposition ourselves). So get those scribbling tools busy.

We want to hear of that new method you have of fitting rings without taking out the pistons and how Cpl. Herkimer Snood has thought up an idea for changing the tires on a Diamond T 6x6 with a nail file and some salt.

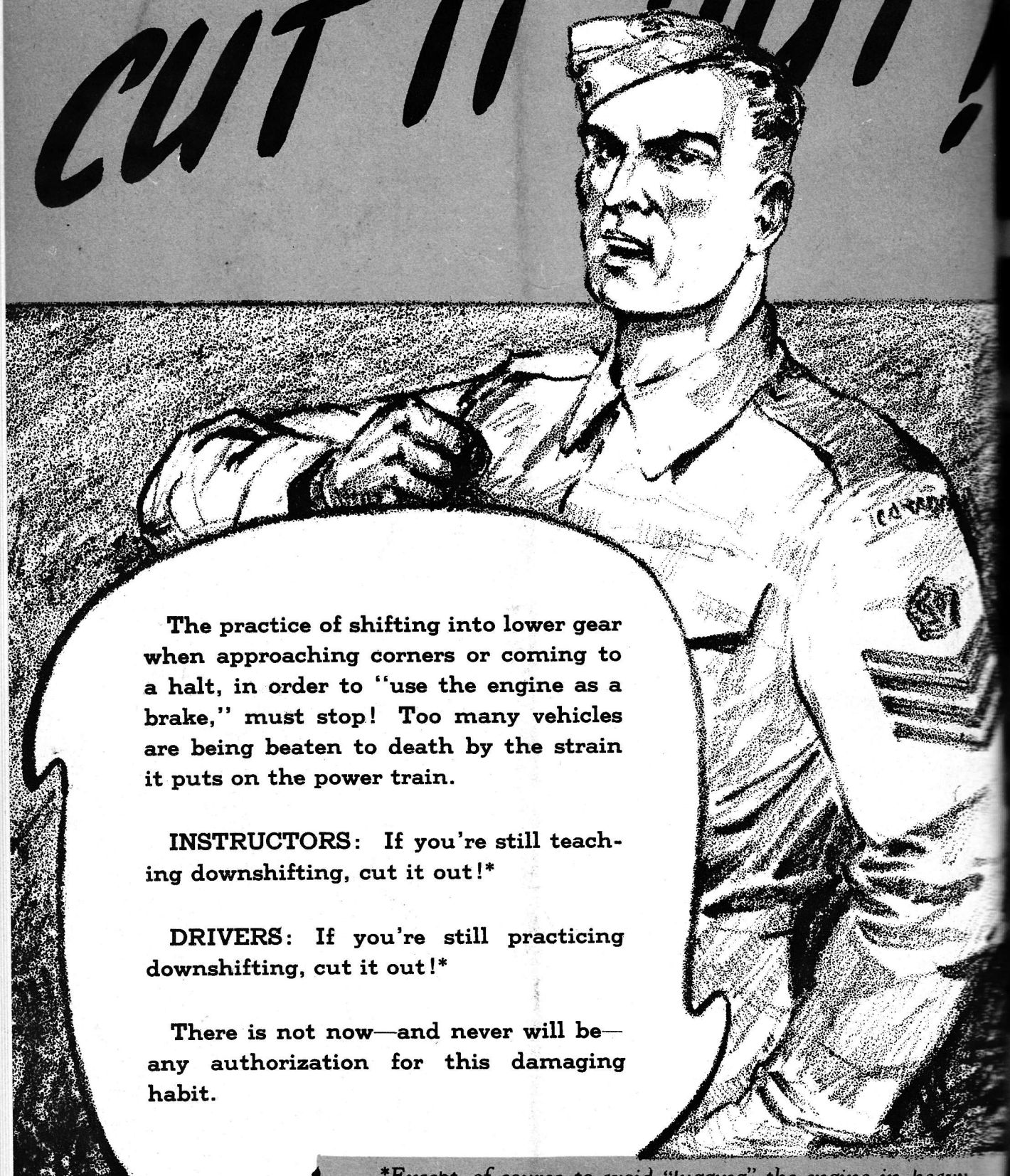
The truth is—we know that there are some very GOOD ideas in "float" throughout the Workshops and Units of our army so why not let's give out with them, then the rest of us dumb bunnies can benefit.

In turn we know that by reading this magazine you'll find a thing or two that will give aid and succour to some of your own pet problems —As Uncle Snodwistle once said "It works both ways."

And while you're at it—let us know what you think of this publication. Let's have your suggestions on the sort of articles that will be of most technical help—particular information you need—criticisms (we can take it). Remember this is *your* magazine so don't be bashful about sending in any ideas you have—just address—The Editor, CAM, Directorate of Mechanical Maintenance, Department of National Defence, Ottawa.

Due to the limited number of copies that can be printed, there are not enough CAMs to go 'round for everyone—so when you've given this issue a going over, pass it along to the other fellows—they'd like to see it too.

CUT IT OUT!



The practice of shifting into lower gear when approaching corners or coming to a halt, in order to "use the engine as a brake," must stop! Too many vehicles are being beaten to death by the strain it puts on the power train.

INSTRUCTORS: If you're still teaching downshifting, cut it out!*

DRIVERS: If you're still practicing downshifting, cut it out!*

There is not now—and never will be—any authorization for this damaging habit.

**Except, of course, to avoid "lugging" the engine in heavy going or on grades.* *See page 12.*